

A New Species of the Fairy Shrimp *Branchinella* (Crustacea: Anostraca: Thamnocephalidae) from Western New South Wales, Australia.

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Branchinella angelica n.sp. is described from the Wilcannia area in western New South Wales. Its frontal appendage is distinctive and consist of a two branches, each with a central subbranch of a pad on a short peduncle and a large main branch with many lateral and medial digitiform processes of varying complexity. Other male characteristics are unremarkable and the female is like many others in *Branchinella*. So far it has been found only in artificial sites, so that its natural habitat is unknown.

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Key Words: *Branchinella angelica* n. sp., *Branchinella campbelli*, eggs, frontal appendage, thoracopods.

INTRODUCTION

Australia has three genera of fairy shrimps (*Branchinella*, *Streptocephalus* and *Australo-branchipus*) and two related brine shrimp genera (*Artemia* and *Parartemia*) (Rogers and Timms, 2014). *Branchinella* is by far the most speciose genus, with 39 species presently known with 14 occurring in New South Wales (Geddes, 1981; Timms, 2015, and unpublished data). The only species actually recorded in the Wilcannia area, in the southwest of the state, is *B. lyrifera* (Linder, 1941), though species widespread in Australia are likely to occur there. Such species include *B. affinis* and *B. australiensis* from within 100 km of Wilcannia (author, unpublished data). Years ago I found two individuals of an apparent new *Branchinella* species in a roadside stock dam 19 km SE of Wilcannia, but the diagnostic frontal appendages were immature so they were put aside. Now I have abundant mature specimens of what I believe is the same species from a roadside burrow pit 10 km west of Wilcannia. It is the purpose of this paper to describe this new species.

METHODS

Specimens were examined and drawn under a Wild M3C stereomicroscope with a drawing tube and the 5th male thoracopod was studied under an Olympus BH monocular microscope at mainly 100x. A digital picture of the frontal appendage was taken with a Leica MZ16 Stereo Microscope with a SPOT Flex CCD camera, using Helicon Focus Z stacking software. Eggs were photographed on a Zeiss Evo LS15 SEM using a Robinson Backscatter Detector. Specimens were prepared as detailed in Timms and Lindsay (2011).

SYSTEMATICS

Class Crustacea Brünnich, 1772
Order Anostraca Sars, 1867
Family Thamnocephalidae Packard, 1883
***Branchinella* Sayce, 1903**

Branchinella Sayce, 1903: 233; Linder, 1941: Henry, 1924: 129; Linder, 1941: 244; Geddes, 1981: 255-256; Rogers, 2006: 15-16.

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Type species

Branchipus australiensis Richters, 1876 by subsequent designation.

Branchinella angelica n. sp.

Etymology. This species is named for its beautiful angelic frontal appendage which to some look like angel wings.

Type Locality. New South Wales, ca 10 km W of Wilcannia, roadside borrow pit at 31° 22' 12.1"S, 143° 17' 19.8"E.

Type Specimens. *Holotype.* Male, 17.1 mm long, collected BVT from the type locality, 29 January, 2015. AM P97828; *Allotype.* Female 21.1 mm long, same data as holotype, AMP 97829; *Paratypes* 2 males, 19.5 and 17.5 mm long, 2 females, 20.0 and 18.6 mm long, some data as holotype, AM P97830.

Other Material. Six males and 4 females from the type locality, same data as above. AM P97831.

Diagnosis. Male with an elaborate frontal appendage, with two sub-branches each with a central pad on a short peduncle and a lateral elongated structure serially commencing basally with about 20 long digitiform processes laterally, followed by about 8 short digitiform processes medially and subapically with about 7 very short digitiform processes laterally. Each finger terminating in a short spine. Basal antennal segment cylindrical and unadorned. Female unremarkable and typical of many species of *Branchinella*. Egg surface with about 22 deep polygons.

Description. *Male.* Head of typical structure for *Branchinella* (Fig 1A), i.e. with two large compound eyes on short peduncles, ocellus small and insignificant located dorsally between the eyes, first antennae filiform, almost as long as proximal segment of the second antenna, and second antenna with proximal segment robust and fused basally and distal segment consisting of a pair of curved pincers about the same length as the proximal segment. Pincer proximal segment smooth all over and distal segment curved concavely more in shrimp vertical than horizontal plane. Apex blunt and slightly expanded and inner surface with many weak ridges at right angles to pincer axis.

Frontal appendage elaborate (Figs. 1B and C, 2A) forked near base into two branches, each broad proximally but narrowing distally to an acute apex. About 20 long digitiform processes laterally commencing from the fork at about the length of the

first finger and gradually shortening at each distal insertion. Each finger terminating in a spine and with pairs of lateral protrusions, the number decreasing distally along the row. After a short gap about 8 short digitiform processes spaced on medial surface, each without lateral protrusions but terminating in a spine. Finally about 7 very short digitiform processes close together on the lateral margin, each with a short terminal spine. About a third way along the medial margin of each branch an oval flat protrusion on a wide peduncle.

Eleven thoracic segments each with a pair of thoracopods. Fifth thoracopod (Fig 3) with endite 1+2 and endite 3 evenly curved, the former about four times the size of the latter. Anterior seta of endite 1 with a single pecten of spines, anterior seta of endite 2 half length of anterior seta 1, more stout and curved and also bearing a single pecten of spines, anterior seta of endites 3-5 similar to that of endite 1. Posterior setae of endites two-segmented and longest of all thoracopod setae (only one shown on Fig 3). They number about 42 on endite 1+2, 15 on endite 3, 3 on endite 4 and 2 each on endites 5 and 6. Endopodite broadly square-shaped but with a shallow notch distally closer to lateral margin than medial margin. Endopodite with about 30 single segmented feathered setae. Exopodite elongated and bearing about 50 single segmented feathered setae. Epipodite bent oval-shaped and without setae. Praeepipodite foliaceous, oval and with a scalloped margin; scallops smallest at distolateral margin.

Other thoracopods of similar structure particularly third to eighth, with some reduction in size and complexity anterior and posterior to these.

Two genital segments (Fig 1D), the first larger than the second and bearing widely separated gonopod bases. When everted, gonopods reach to about half way along the second abdominal segment; bulbous with many backwardly pointing spines, and with a row of triangular spines medially, larger proximally than those sited distally. No other protrusions on genital segments.

Six abdominal segments and a telson bearing a pair of cercopods, about 1.5 times the length of the last abdominal segment.

Female. Head (Fig 1E) with two large compound eyes on short peduncles, ocellus small and insignificant located centrally just anterior to the eyes, first antennae filiform and a little shorter than second antennae. Second antennae flat, somewhat rectangular, about three times broader than long and terminating in a symmetrically placed narrow sharp projection.

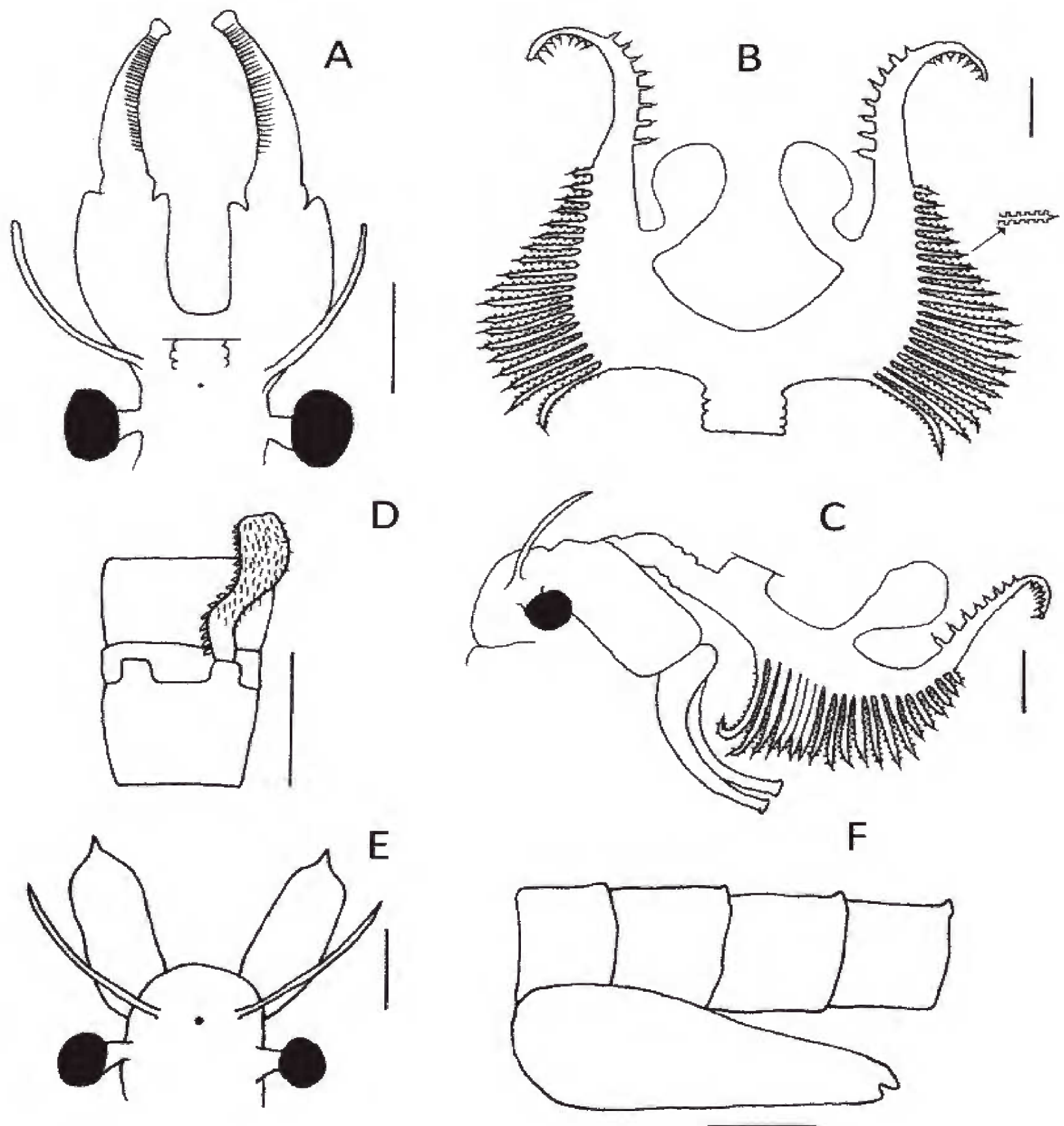


Fig 1. *Branchinella angelica* n. sp. A, male head, dorsal aspect; B, frontal appendage, dorsal aspect; C, male head with frontal appendage, lateral aspect; D, male genital segment with one gonopod expanded, ventral aspect; E, female head, dorsal aspect; F, female genital segments and first two abdominal segments with brood pouch, lateral aspect. Scale bars 1 mm.

Thorax of eleven segments each bearing a pair of thoracopods of similar structure to those of the male. Two genital segments, the first shorter than the second and bearing ventrally a brood pouch expanded proximally and extending to about the second abdominal segment. Six abdominal segments as in the male.

Egg (Fig 2B) spherical $206.8 \pm 4.5 \mu\text{m}$ diameter ($n=5$) with about 22 polygons with wide rounded ridges and deep (ca $22 \mu\text{m}$) flatish floors occupying about a third of the polygons, the remainder being the slopes of the ridges.

DISCUSSION

This species belongs to the genus *Branchinella* because it has gonopods with a single row of larger lateral spines and many smaller spines on the distal half of the everted portion (Brendonck, 1997; Rogers, 2006). Having a frontal organ is also typical, but not absolutely diagnostic (Geddes, 1981; Rogers, 2006).

The thoracopods are like those of other *Branchinella* species for which data are available (Geddes, 1981; Timms, 2001, 2002, 2005, 2008, 2012;

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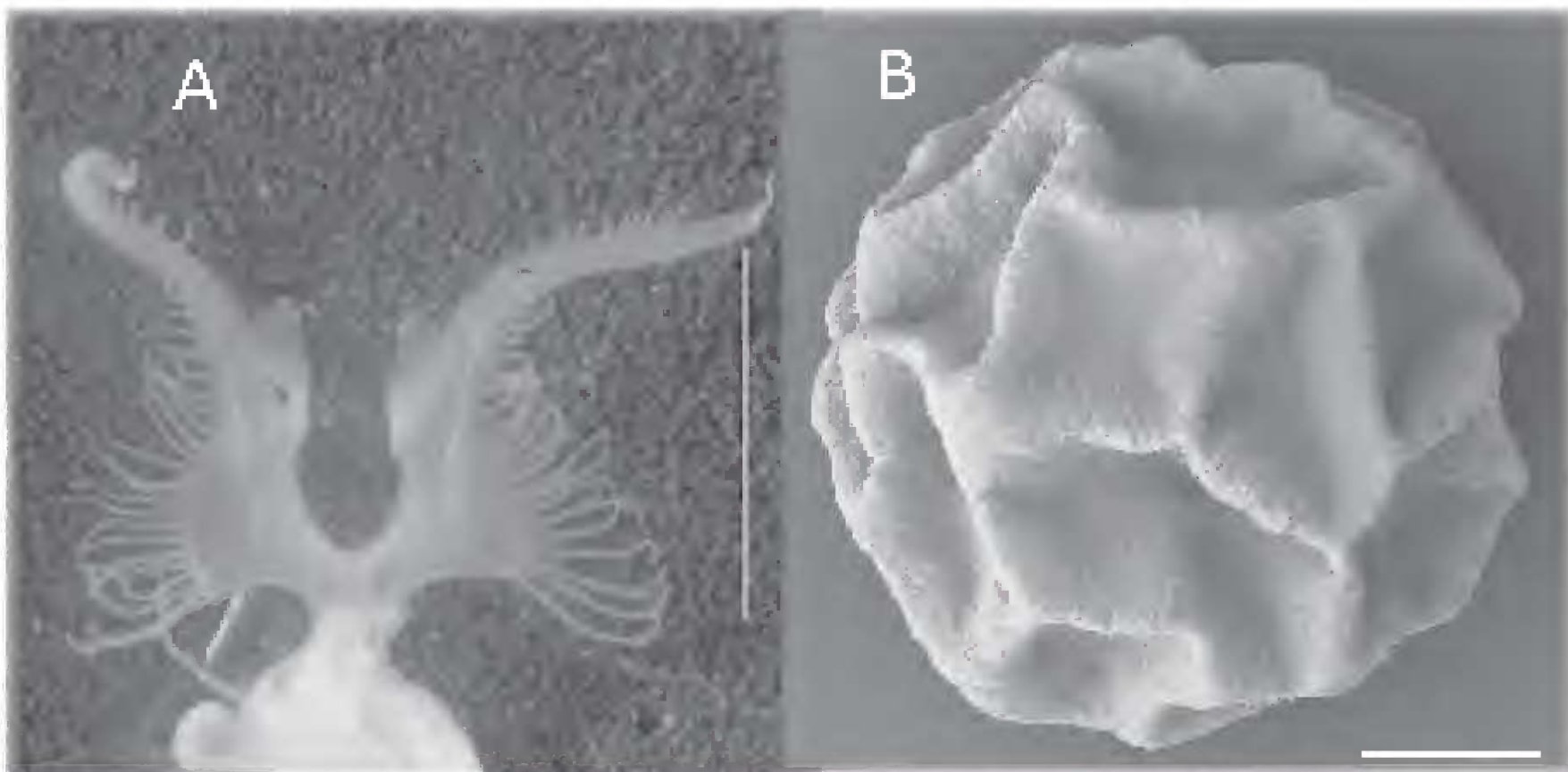


Fig 2. *Branchinella angelica* n. sp. A, image of frontal appendage, scale bar 5 mm; B, egg, scale bar 50 μ m.

Timms and Geddes, 2003), with just minor variations in proportions of the endopodite, exopodite, epipodite and praeepipodite, in relative size and spination of

the anterior setae, and in size and numbers of anterior setae (cf. Fig 3 with Figs 1 & 2 in Timms, 2001, Figs 6,7,8,&10 in Timms 2002, Figs, 7,8 & 9 in Timms and Geddes, 2003, Fig 5 in Timms, 2008 and Figs. 3 & 9 in Timms 2012).

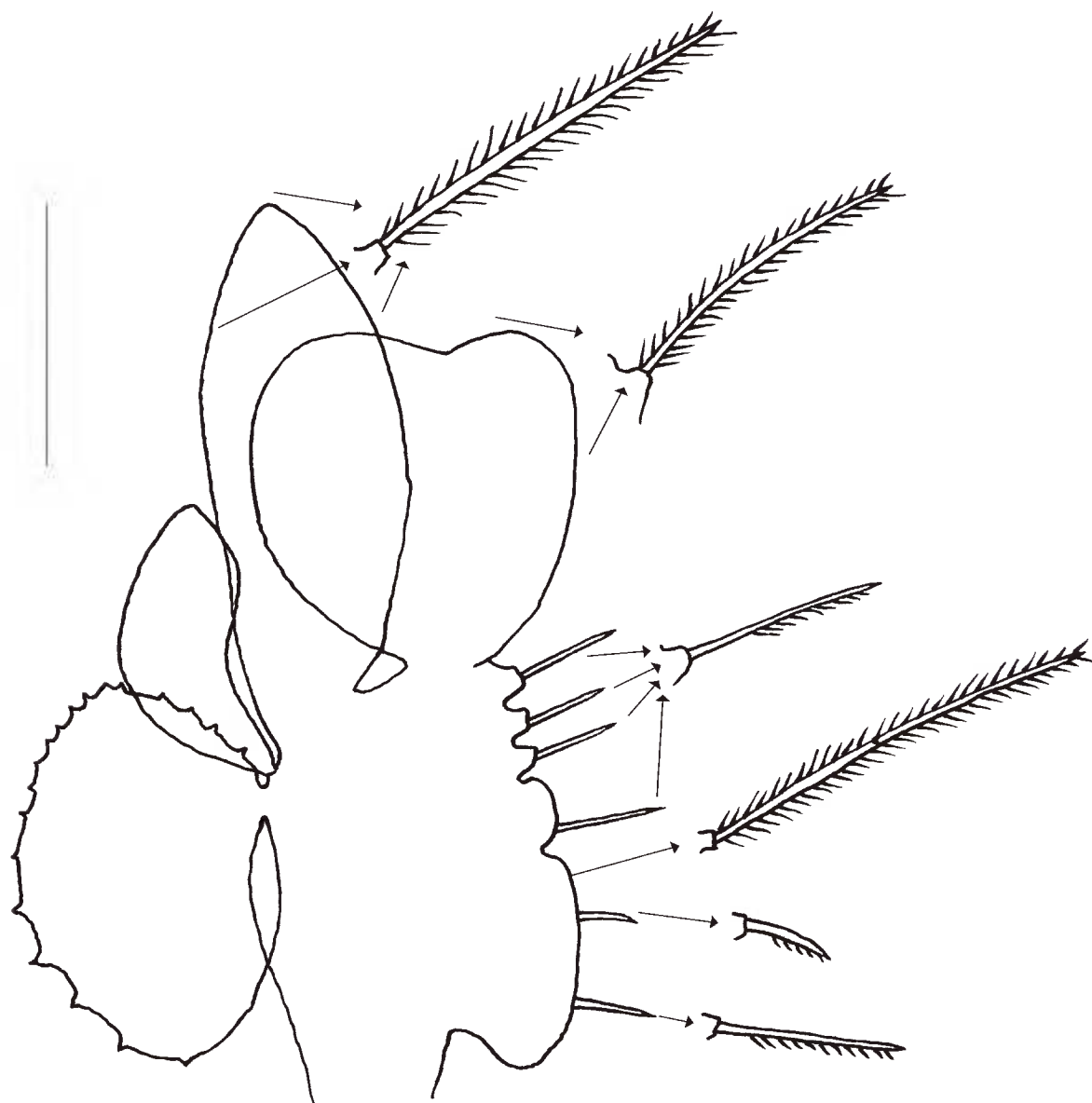


Fig 3. *Branchinella angelica* n. sp. Male fifth thoracopod. Arrows show the seta enlarged or the area of the thoracopod in which that seta occurs. Scale bar 1 mm.

It is the frontal appendage of the male that is the most distinctive feature in most *Branchinella* species. The frontal appendage of *Branchinella angelica* is most similar to that of *B. campbelli* Timms (Fig 4A,B). This species too has pads placed centrally on each branch of the frontal appendage and an array of digitiform processes laterally on each branch. However the digitiform processes of *B. campbelli* are of simpler structure than those of *B. angelica* and are all placed laterally whereas in *B. angelica* the basal group are lateral and the middle group of 8 are inserted medially. The second antennae are different in the two species: notably there is a rounded protrusion on the basomedial surface of the proximal segment in *B. campbelli* and not in *B. angelica*. The two halves of the basal segment are angled at about

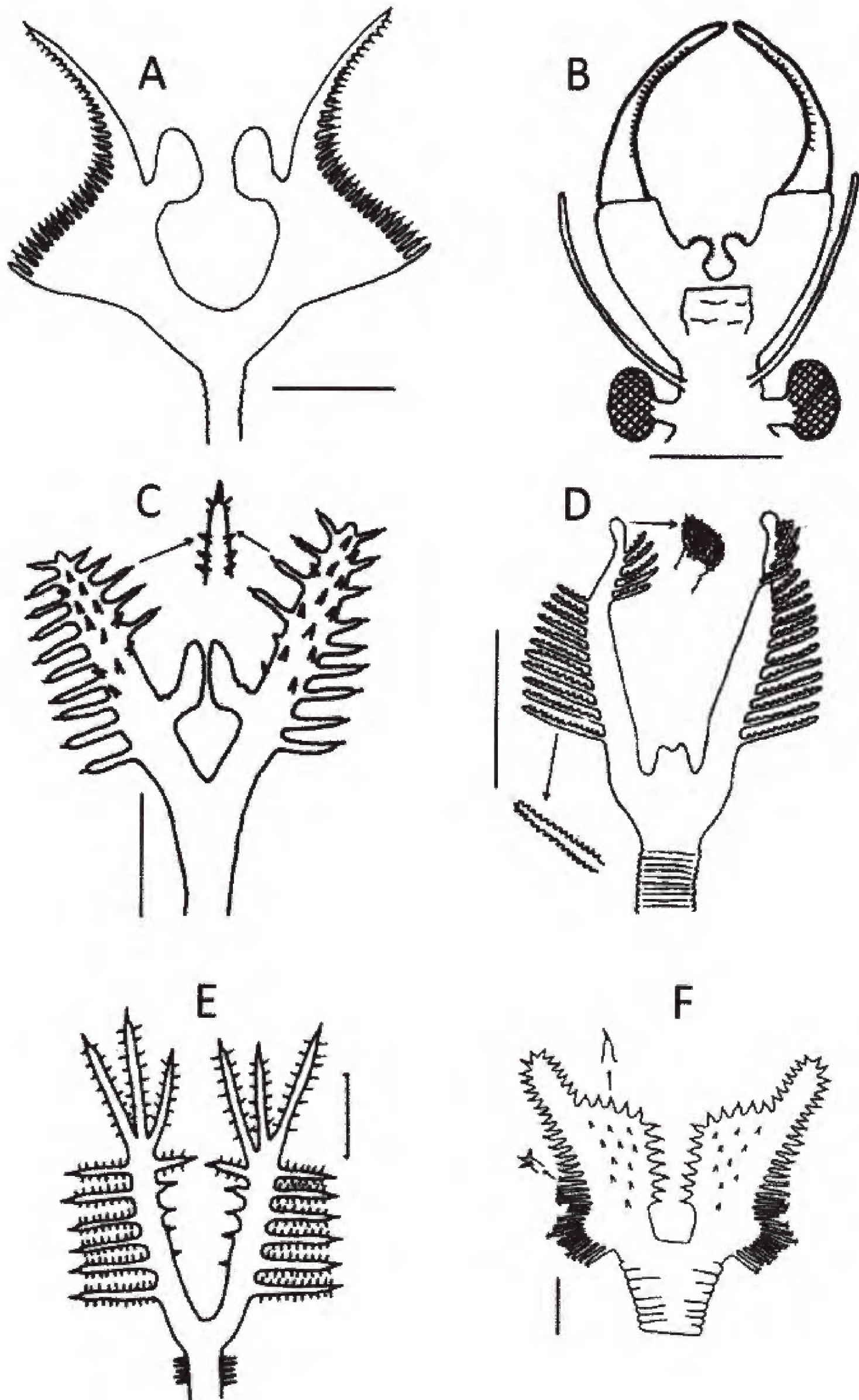


Fig 4. Other similar species of *Branchinella*. A & B, *B. campbelli* from Timms, 2001, A frontal appendage, B, head and antennae; C, *B. herrodi* frontal appendage from Timms, 2012; D, *B. tyleri* frontal appendage from Timms and Geddes 2003; E, *B. multidigitata* frontal appendage from Timms, 2008; F. *B. kadjikadji* frontal appendage from Timms, 2002. Scale bars 1 mm.

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60° to the shrimp body axis in *B. campbelli* whereas the two halves are almost parallel (and hence in line with the body axis) in *B. angelica*. Finally the apex of the distal segment is enlarged in *B. angelica*, but not in *B. campbelli*.

The other *Branchinella* species with a central enlargement of the frontal appendage is *B. herrodi* Timms (Fig 4C). However while this sub branch is broadly similar, it is not expanded distally as in *B. angelica* and *B. campbelli*, and the remainder of the frontal appendage is not expanded and the fingers are fewer and similar. The only other *Branchinella* species with digitiform processes on the lateral branches of the frontal appendage on serially alternate sides is *B. tyleri* Timms and Geddes (Fig 4D). However this species lacks the central subbranch of the frontal appendage and its digitiform processes lack the variety and numbers in *B. angelica*. *Branchinella multidigitata* Timms (Fig 4E) and *B. kadjikadji* Timms (Fig 4F) also lack the central subbranch but have numerous digitiform processes laterally and medially. However their arrangement and numbers are quite different from that in *B. angelica*.

The eggs of *B. angelica* are not distinctive, being unseparable from those of *B. affinis* Linder, *B. frondosa* Henry, *B. halsei* Timms and *B. macraeae* Timms, and similar to, but distinguishable with difficulty, from those of *B. basispina* Geddes, *B. campbelli* Timms, *B. erosa* Timms and *B. lamellata* Timms (Timms and Lindsay, 2011). *Branchinella angelica* eggs are easily distinguished from those of the other 32 known species of *Branchinella*.

Branchinella angelica is known only from around Wilcannia on the Darling River in southwestern New South Wales. It almost certainly does not occur further north in the Paroo and Warrego catchments of the Darling basin in western NSW, where extensive collections have not recorded it (Timms and Sanders, 2002); this area has the similar *B. campbelli*. The natural habitat of *B. angelica* is unknown, the present record being from a roadside burrow pit and a past indication from a stock dam.

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